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« Fixed Exchange Rate Regimes and Price Stability : Evidence from MENA Countries »

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Fixed Exchange Rate Regimes and Price Stability: Evidence from MENA Countries

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Abstract

In this study, we empirically test whether pegged regime was successful in achieving and maintaining consistently low inflation rates in 17 MENA countries over the period of 1980-2007. Taking into account unobserved country heterogeneity, as well as, the endogeneity of exchange rate regimes we estimate a dynamic panel data model of the effects of exchange rate regimes on inflation using officially announced exchange rate regimes in addition to *de facto* regimes in place. Our findings suggest a strong link between the choice of the exchange rate regime and inflation performance.

The disjunction between *de jure* and *de facto* policies yields different results. *De jure* fixed exchange rate was not successful in assuring low and stable inflation rates as theoretically supposed because of a lacks of credibility. On the contrary, inflation is found to be considerably lower under *de facto* fixed regime. A robustness test account for discrepancies between the *de jure* IMF and the *de facto* regimes of Reinhart and Rogoff (2007), and Levy-Yeyati and Sturzenegger (2005) shows that credible commitment to fixed exchange rate system or a fear of floating behavior were significantly associated with better inflation performance.

Keywords: Inflation, Exchange rate regime, Instrumental variable GMM

Jel Codes: F31, F33

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Résumé

Cette étude examine empiriquement si le régime de change fixe a effectivement permis d'atteindre et de maintenir un taux d'inflation faible dans les pays de MENA sur la période de 1980-2007. Tenant compte de l'hétérogénéité non observée pays, ainsi que, l'endogénéité des régimes de change, nous estimons un modèle dynamique de données de panel de l'effet de régimes de taux de change sur l'inflation en fonction de l'annonce officielle des autorités et les pratiques *de facto*. Nos résultats suggèrent un lien étroit entre le choix du régime de taux de change et d'inflation.

La disjonction entre les politiques de change de jure et celles de facto donne des résultats différents. Le régime de change fixe (*de jure*) n'a pas assuré un taux d'inflation faible et stable comme aurait dû théoriquement parce que il manque la crédibilité.

Au contraire, le régime fixe *de facto* a entraîné une baisse considérable des taux d'inflation.

Un test de robustesse qui prend en compte les divergences entre les régimes *de jure* (FMI) et ceux *de facto* de Reinhart et Rogoff (2007) et de Levy-Yeyati et Sturzenegger (2005) montre que l'engagement crédible au système de taux de change fixe ou un comportement de crainte de flottement ont été considérablement associée à une meilleure performance de l'inflation.

Keywords: Inflation, Exchange rate regime, Instrumental variable GMM

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1. Introduction

Over the past decades, MENA has experienced several inflationary shocks. To deal with price volatility and to curb inflation, many MENA countries have chosen the policy of fixed exchange rates as the preferred policy anchor. The reasoning was that by pegging their national currencies to a strong currency (principally to the US dollar) they could import credibility and confidence to their economies. But in doing so, the central banks lose control of domestic monetary policy. However, the underdeveloped monetary institutions in MENA appear to undermine the successful use of discretionary monetary policy. More importantly, concerns related to the fear of floating hypothesis of Calvo and Reinhart, (2002) and to the domestic original sin hypothesis of Eichengreen and Hausmann, (1999) have made countries in MENA reluctant to fluctuation in nominal exchange rate.[1] So fixed exchange rate regime - beyond the limits of its sustainability- seems, in practice, a logical choice for MENA.

In the early 1990s, some MENA countries, while ensuring reforms, have moved towards greater exchange rate flexibility. In latest recent years, countries with greater exchange rate flexibility seem to hold relatively well in term of inflation performance.[2] The subsequent dollar depreciations since early 2002 and the run-up of USA's inflation rate and world market price explosion have exacerbated domestic inflation level in MENA countries with fixed peg to the dollar. In light of this recent experience, an increasing number of economists have come to question the appropriateness of dollar peg in assuring price stability in MENA advising, instead, a gradual shift to a more flexible exchange rate arrangements such a peg to a basket of currencies.

Several influential papers have tried to assess the relationship between the choice of a particular exchange rate regime and inflation using worldwide sample countries. Obtained results were highly dependent on sample selection, methods of estimation and on the classification used, making it difficult to establish a clear cut link between exchange rate

[1] The flexibility of exchange may be an independent source of inflation for countries that are more open (higher pass-through from exchange rate to inflation), with high liability dollarization or with high ratio of debt in foreign currency.

[2] Several countries, Turkey, Egypt, have put in place, more recently, an inflation targeting frameworks or some form of this monetary policy framework while other MENA countries such as Morocco and Tunisia have implicitly targeted inflation, and have progressively moved towards an inflation-targeting regime. (See Neaime 2008 for more detail).

regime and inflation opening, however, an empirical question pertaining the existence of a possible relationship in a specific region.

In this paper we depart from many existing empirical studies in an attempt to assess the relative importance of the link between exchange rate regimes and inflation in MENA region for 1980 - 2007 periods. Most countries in MENA have been keeping for a long time a quasi-fixed exchange rate regime making this region an interesting case study that could provide some empirical evidence about the link between exchange rates and inflation. Subsequently, this may also helps to inform policies on the appropriate exchange rate policy to be implemented.

The recent inflation experience of MENA, partly due to the dollar's weakness, has received relatively higher attention and the research for alternative exchange rate arrangements has regained importance. However, to our knowledge, only one study, this of El-Achkar and Shahin (2009), tried to evaluate the experience 18 MENA counties with pegged regimes over the 1975-2005 periods using pooled OLS estimation. These authors use IMF's de jure classification as well as the de facto classification of Bubula Otker-Robe (2002) to perform their estimation. Their results reveal no significant link between exchange rate regime and inflation irrespective of the applied method of classification. Further, in order to assess the robustness of their result, they re-estimate their model for subsample of MENA countries (Gulf Cooperation Council (GCC), North African and other MENA countries), but their main results remain unchanged.

This paper improves upon the evidence presented by El-Achkar and Shahin (2009) in four dimensions: 1/ we present evidence for a more recent sample period from 1980 to 2007. 2/ we use the Reinhart and Rogoff (2007), and Levy-Yeyati and Sturzenegger (2005) de facto classification besides to the de jure classification of the IMF. 3/ as de jure fixed exchange rate may fall short of credibility , we also try to differentiate between countries that keep a credible pegged regime and those that are not by matching de jure with de facto exchange rate policies. This reflects the extent to which political and institutional factors impact the formation of expectations therefore country inflation performance.[3] 4/ unlike El-Achkar and

[3] For example, several countries in our sample are small open economies, that maintain a credible fixed rate and so these countries are expected to have very different inflation dynamic from the large, mostly closed economies

Shahin, we also address the issue of exchange rate regime endogeneity which may be of important concern when assessing exchange rates stability impact on country inflation performance. Our findings suggest a strong link between the choice of the exchange rate regime and inflation performance.

The reminder of this paper consists of the following sections: section 2 reviews some empirical studies conducted on the relationship between the nature of the exchange rate regime and inflation performance. Section 3 uncovers some stylised facts about inflation behaviour in our sample period, focusing briefly on inflation performance under various exchange rate regimes classifications. Section 4 presents the model and the testing methodologies employed, the results obtained and discuses the impact of discrepancy and/or consistency between de jure and de facto policies on inflation outcome. Finally, section 5 concludes.

2 Inflation Performance and Exchange Rate Regime: some theoretical and empirical insight

The direct impact of exchange rate regime on inflation performance is related to the role of exchange rate anchor in addressing the credibility deficit of monetary authorities in countries with high inflation rate. Pegging the exchange rate (typically vis a vis the dollar) could influence inflation expectations that, inasmuch as the peg is credible, would lead to lower inflation rates. Fixed exchange rate, being a highly visible commitment, provides incentives for high macroeconomic and financial performance so as to maintain confidence in the fixed exchange rate, especially if political costs of loose monetary and fiscal policies are high, Obstfield and Rogoff (1995), Ghosh et al (1996, 1997).

Underlying this credibility hypothesis, there is the time inconsistency argument by which high inflation expectations induce high inflation equilibria with steep nominal interest rates that, in turn, make it optimal for the government to dilute its debt burden through inflation, generating

that did not keep a such credible fixed regime or who manifest an apparent desirability to stable exchange rate but at the same time allow more flexible response in time of pressure.

an inflation bias. The credibility and the macroeconomic discipline, that fixed rate regime is supposed to bring, are hence neither automatic nor guaranteed.[4]

In spite of the theoretical link, empirical evidence was more elusive and rather tended to support the case for fixed exchange rate regime. Such relation is found, however, highly dependant on a host of factors. Examples include the quality of institution that varies across countries; the level of details in the regime classification, as the classification schemes by which each researchers start may produce remarkably different results; the occurrences of shocks that directly influence the probability of exchange rate regime collapse and therefore of capturing the true impact of exchange rate regime on inflation which is referred to as the *Survivor Bias*; the so called *Lucas Critique*, since policy regime shifts alters the expectation formation on future inflation rate by economic agents and hence affect evaluating the impact of policy changes on inflation performance. An additional discussion concerns the possible reverse causation between exchange rate regime choice and inflation and researchers attempts to control for this endogeneity. In what follow, we present a short review of empirical studies that have investigated the relationship between exchange rate regime and inflation while controlling for some of the previously mentioned factors.

Using de jure as well as de facto classifications, Ghosh, Gulde, Ostry and Wolf (1997) found that fixed exchange regimes deliver lower rates of inflation than more flexible regimes on a panel of 136 countries over 1960–1990. The combination of commitment to exchange rate stability (credibility effects) and monetary growth (discipline effects) help to ensure more stable inflation rate. However, their result indicates that discipline effects were stronger in explaining inflation performance. Controlling for endogeneity and cross-country heterogeneity reveals two interesting findings. For countries with very low inflation rates (generally high-income countries) where credibility results from other mechanisms such as the absence of capital controls and for countries with frequent changes in their parities, where credibility is low; the choice of the exchange rate regime have only a small marginal effects. Levy-Yeyati and Sturzenegger (2000) using data on 159 countries over the period 1974-1999 and employing their own *de facto* classification find that inflation rates were quite similar

[4] This conventional wisdom, according to which fixed rate regimes provide more fiscal discipline than flexible regimes, has been questioned theoretically and empirically by Tomell and Velasco (2000). In their inter-temporal approach, they show that a lax fiscal policy today is reflected more quickly in current exchange-rate movements under floating exchange rate, whereas pressures are allowed to build and accumulate under fixed rates until they overwhelm the system.

between fixed rate regimes and pure floaters but inflation rates were much higher for intermediate regimes group.

Rogoff, Husain, Mody, Brooksand Oomes (2003) conduct their analysis on a sample of 120 economies over 1940-2001 period. Countries were divided into three sub-groups; developing, emerging and advanced countries. Their results show that exchange rate flexibility was significantly associated with higher inflation rate in developing economies, while in emerging economies this relationship appears insignificant. Moreover, in advanced economies, where institutions are strong and central banks have independence, Inflation appears to be low, even under flexible exchange rates. In recent research,Bleaney and Francisco (2005) have shown the contrast in inflation performance between *de jure* and alternative *de facto* exchange rate classifications. Using large sample of developing economies over the 1985 – 2001 periods, they find no significant difference between soft peg and floating regimes under the *de jure* IMF, *de facto* Levy-Yeyati and Sturzenegger and the Bubula Otker-Robe classifications. However, the inflation rate was shown to be significantly higher when Shambaugh (JS) and Reinhart and Rogoff (RR) *de facto* classification have been used.

Domac, Peters and Yuzefovich, (2004) show, controlling for both exchange rate regime endogeneity and the *Lucas Critique*, that the credibility provided by fixed exchange rate explains the good inflation performance in a sample of 22 transition economies through 1999s. Moreno (2000 and 2001), adjusting for episode of currency crisis, finds same results on a sampler of 98 developing countries for the 1974-1999 periods. Similar results were found by De Grauw and Schnabl (2008) on a sample of 19 South Eastern and Central European countries over the period 1994-2004.

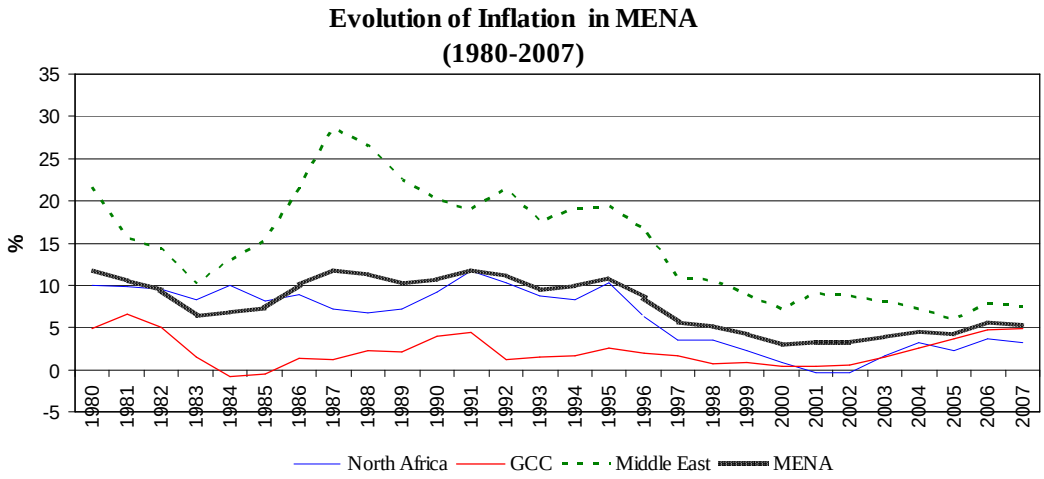
3 Inflation and Exchange Rate Regime in MENA

In this section, we first present an overall picture on the development of inflation in MENA. We then compare inflation performance under the fixed and flexible exchange rate using alternative regime classification.

3.1 Inflation Evolution: an overview picture

A combination of global and domestic factors affected the inflation dynamic process in MENA over the past three decades. Figure (1) illustrates the evaluation of CPI inflation rate in MENA countries over the period of study.

Figure 1



Based on figure 1, we remark that while inflation rate has been declining substantially from the relatively high level of the early 1980s, there has been a new raise in inflation since the period 1983 to 1995 particularly in other MENA countries group. These movements in inflation rate were closely linked to the ongoing geopolitical tension in the region, as like the Iranian-Iraqian wars in 1988, Gulf war 1990-1991 and negative term of trade shocks (oil market's crash in the early 1980s). The downward trend in inflation in Maghreb countries appears, however, to have reversed since around the middle of 1998.

In the late of 1995, inflation rate has dropped from double to signal digit. Starting 2000s, inflation rate showed an accelerating trend, but it was not as high as inflation rate experienced through mid 1980s -1990s period. By the end of 2000s, inflation differential between the three regions became small with noticeable favourable inflation convergence in Maghreb countries which may due, in part, to the appreciation of their currencies against the US dollar.

This new increases in inflation rate could be explained by exogenous shocks to the region, such as the American intervention in Iraq in 2003, higher prices for oil and other commodity prices on international market reflecting growing demand from emerging market countries. Even more, the subsequent weakness of the dollar gives rise to additional inflationary pressure especially in countries that peg to the dollar which is caused not only by exchange

rate pass-through to import prices but also by constraining central banks independency in their use of interest rates to tackle rising inflation keeping in mind that the room for manoeuvre in the area of interest rates depends on the degree of capital account liberalisation.

3.2 Exchange Rate-Regimes Classification and Inflation Performance: Descriptive analyze

Choosing the proper classification of exchange rate arrangements before investigating is crucial and not straight-forward. In particular the exclusive use of the officially announced or (*de jure*) exchange rate regime could be misleading since countries often do not follow the regime they publicly announce. Many important research papers on exchange rate regimes stress the gap between what countries say they do and what they really do. This has motivated a literature on data-driven methods for the classification of exchange rate regimes where the most popular of which has been Reinhart and Rogoff (2007), hence after RR and Levy-Yeyati and Sturzenegger (2005), hence after LYS. The former classification (RR) identifies a 14 fin and 6 course options for exchange rate regime, applied to 277 countries for the period 1940-2007 while the latter one (LYS) classify regime for 199 countries over the period 1974-2004 into five and three broad categories with an additional inconclusive category for unidentified data observations.

In our empirical work we use IMF *de jure* classification in addition to the RR and LYS *de facto* classification. To construct our exchange rate regime measure, we group the IMF (*de jure*) and the RR and LYS (*de facto)* various exchange regimes categories into two main categories, fixed and flexible. Since these three classification schemes are different in important ways (as to the identification algorithm used or in view of the number of reported regimes), a common measure to regroup these various exchange rate regimes is to look on bands within which the fixed exchange rate is allowed to move. Countries that keep its nominal exchange rate within $\pm 2\%$ bands are defined hence as having fixed exchange rate regime. See table 1 in the appendix for more information.

Table and Figure 2 portrays simple descriptive analyse of inflation performance under alternative exchange rate regimes and classifications.

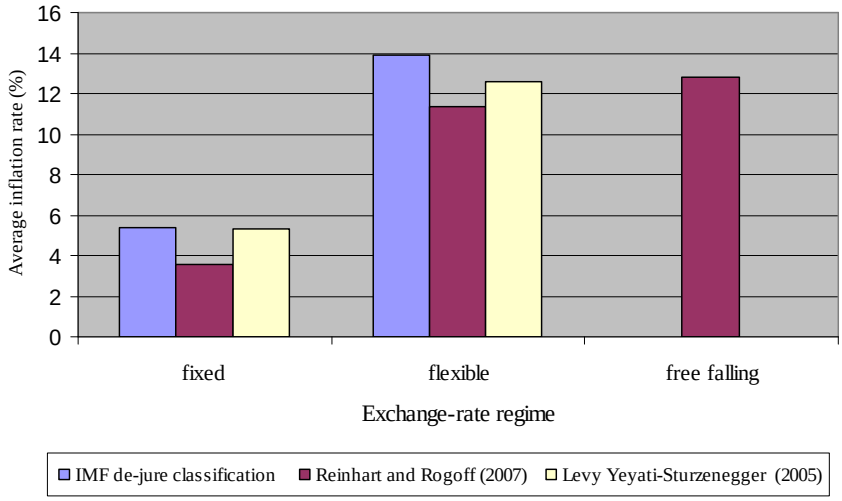
Table (2) : Inflation and Exchange Rate Regimes

	IMF		RR		LYS	
	Fixe	Flexible	Fixe	Flexible	Fixe	Flexible
Inflation						
Means	5.42	13.86	3.55	12.07	5.29	12.58
Medians	3.32	8.91	2.80	11.36	3	8.23

Note: *Exchange rate classifications: IMF de- jure classification from IFS, RR de –facto Reinhart and Rogoff (2007) ; LYS de-facto from Levy-Yeyati and Sturzenegger (2005).*

Figure 2

Inflation performance of fixed and flexible regime under three classification schemes (period average 1980-2007)



A common picture suggests that fixers exhibit considerably lower average inflation rate. The average inflation under the IMF classification spans from 5.42% in the fixed regime to 13.86% in the flexible category. Inflation rate was much lower under the RR classification with a reordered average of 3.55% compared to 12% under flexible regimes (free-falling excluded) while in the LYS classification inflation rate spans from 5.29% for the fixed regime to 12.58% for flexible one.

4 Empirical Evidences

4.1 Model Specification

Our data constitute an unbalanced panel due to missing observations; the actual sample contains 446 observations. The IMF‘s *International Financial Statistics* (IFS 2009) and the *World’s Bank’s Development Indicators* (WDI) constitute our main source of data. Table (3) in the appendix provides information on data construction and sources.

Our dynamic model of inflation can be written as:

$$\pi_{i,t} = \alpha_0 + \lambda \pi_{i,t-1} + \beta_1 M1_{i,t} + \beta_2 GDP_{i,t} + \beta_3 ERR_{i,t} + \beta_4 OPEN_{i,t} + \beta_5 Oil_{i,t} + \varepsilon_{i,t}$$

Where $\pi_{i,t}$ refer to inflation rate and $\pi_{i,t-1}$ is its lagged value that captures inflation persistence as well as the role of expectation λ <1.

The term $\varepsilon_{i,t}$ is a mean zero disturbance: E(ε)=0 and $\varepsilon_{i,t}$ is a specified error component model:

$$\varepsilon_{i,t} = \mu_i + e_{i,t} \qquad i = 1, \ldots, I, \qquad t = 1, \ldots, T \qquad \text{where ;}$$

μ_i is country-specific effect and $e_{i,t}$. is white noise and E(μ_i) = E($e_{i,t}$) =E($\mu_i e_{i,t}$)=0
We assume initially that the transient errors are serially uncorrelated but we relax this assumption latter.

The framework of our analysis can be derived from some of demand for money equation, in which inflation is a function of money $M_{i,t}$ and real output $GDP_{i,t}$ growth rates. The changes in real GDP and money capture the impact of supply response and the changes in money supply on inflation. It is supposed that prolonged increases in prices are associated with increases in the nominal quantity of money. However, a country with a higher output growth rates tends to have lower rate of inflation for a given rate of money growth. Therefore, differences in the growth rate of output explain some of the imperfect association between money growth and inflation, Barro (1997, p.245)

To this model, we add our variable of main interest, the exchange rate regime *ERR i,t*. The exchange rate system is defined as a dummy variable that takes the value of 1 if fixed

exchange rate regime is in place and 0 otherwise. Our guess here is that fixed rate regime is associated with lower inflation rate to the extent it is credible. The exchange rate classification used here stem from *de jure* IMF, *de facto* Reinhart and Rogoff (2007) and Levy Yeyati (2005).

We also augment our model with openness to trade variable $OPEN_{i,t}$ to capture potential disciplinary effects of openness. [5] The sign of this variable could potentially carry a positive or negative sign as the current literature is somewhat divergent. For example, both Romer (1993) and latter Alfaro (2005) have tested empirically the long-run commitment effect of openness on restricting the usefulness of discretionary monetary policy. However, while Romer results point to negative relationship between openness and inflation rate, Alfaro (2005) finding point the non significant role of openness and indeed an opposite relation in some cases.[6]

In addition to this factor, we include real oil price shock $Oil_{i,t}$. A rise in oil prices probably raises the cost of production, decreases aggregate demand (consumption and latter investment), reduces real output supply and therefore the demand for real cash balances, leading hence price level to increase given a nominal quantity of money, (Gordon, 1984).
Nevertheless, real oil prices shock may impact differently oil's producing and oil's consuming countries. For the latter group, a positive relation between oil prices increases and inflation may holds while for the former group, a rise in oil prices (term of trade gain) raises directly the country's currency value and the net wealth, deriving hence higher consumption and investment. In our sample 70% of MENA are oil exporter's countries. Taking in account the high weight of oil's relating income in budget revenue, we expect a negative relation between oil's prices increases and inflation rate in MENA.

[5] Fiscal stance captured by government budget balance to GDP could be an important factor that may play a key role in the evolution of prices in MENA however data were not available for a large number of countries. In addition, available data was subject to larger real time measurement errors. Nevertheless, although the fiscal policy consideration is not directly considered in the regression, its impact on inflation is introduced indirectly through the money supply growth variable. Sarget and Wallace (1981) argue that for certain time path of fiscal deficit effectively commits government to follow a policy of inflationary deficit finance.

[6] When she used the first difference of the share of imports as a percentage of GDP as the openness measure, the openness variable is found to has a positive significant effect on inflation.

Finally, we include, time dummy (Time-dum) to take account of period of worldwide high inflation volatility.7 All these variables (except for exchange rate regime dummy and openness variable) are taken in log differences. We test then stationarity using panel data unit root test of Maddala and Wu (1999) which is, in contrary to the more popular panel data stationarity tests of Im Pesaran and Shin (2003), applicable to an unbalanced panel like ours. Test results on stationarity show that all data series are stationary except openness variables, so we take it in first difference. Table 4 and 5 report pair wise correlations and descriptive Statistics respectively.

4.2 Estimation Methodology

Pooled least square estimation is applied first to our data for comparison purpose. This estimator is likely to suffer from omitted-variables bias led to overestimation of the lagged inflation rate, Bond (2002). To correct for this bias we use fixed effects estimator (FE). Our choice of fixed effects, as opposed to the random effects estimator is supported by the results of Hausman-type specification test as well as the Breush Pagan multiplier test (1980).[8]

A potential drawback with the using fixed effects estimator is that lagged inflation rate is correlated with the fixed effects in the error term ($\varepsilon_{i,t} = \varepsilon_{i,t} - \bar{\varepsilon}_i$) leading to downwards bias of the coefficient of lagged dependent variables commonly referred to as dynamic panel bias, (Nickell, 1981; Judson and Owen, 1999; Bond, 2002). Nevertheless, this dynamic panel bias will be of concern when panel time dimension is short, Wooldridge (2002). Fortunately, in large T panel as is our case, the country fixed effects which is shown in the error term decline with T, similarly the correlation of lagged dependent variables with the error term will be insignificant, Roodman (2006)[9]

[7] We have first started our estimation employing a large number of factors that could affect on price stability, like as –beside to variables retained- real exchange rate depreciation, interest rate, openness, inflation in USA, growth in OCED countries. A stepwise regression helped us sorting the significant explanatory variables for all countries.

[8] Hausman test rejects the null of no systematic difference between the Within and GLS coefficient estimates (chi2(7) = 24.74 with Prob>chi2 = 0.0008) , supporting a fixed effects model and, Breusch and Pagan Lagrangian multiplier test for random effects rejected the random effects model in favour of fixed effects (chi2(1) = 1.35 with Prob > chi2 = 0.2458)

[9] We ignore thus the possible bias due to the correlation between (demeaned) lagged dependent variable and the (demeaned) error term in the fixed effects estimator.

Further, Breusch-Pagan / Cook-Weisberg test for heteroskedasticity based on the OLS estimates fails to reject the hypothesis of residuals homoskedasticity (chi2(7) = 354.46) In addition, Wooldridge test for autocorrelation does indicate first order autocorrelation of the residuals (F(1,16) = 314.115 with p-value= 0.0000)

We thus add the feasible general least square (FGLS) estimator allowing for country-specific effects with first order autoregressive, and heteroskedastic error term, (Kmenta 1986).

The random effect FGLS specification appears borderline acceptable for our model with sluggish or time-unvarying (for some countries) exchange rate regimes although better specification according to Haussman test still makes one prefer the fixed effects model to the random effects one.

The potential endogeneity of some regressors has to be taken in account; in particular, the exchange rate regime dummy is likely to be endogenous. As might be expected, countries with low inflation are probably better able to maintain a pegged exchange rate trivially; persistent high inflation is inconsistent with maintaining a fixed rate. Omitting this possibility makes the reported estimates for exchange rate regime dummy inconsistent and therefore not useful to make inference on the estimated parameters.

Instrumental variables approach allows for some variables to be considered as endogenous. Further, giving the evidence of both heteroskedasticity and serial correlation in our data we opt for linear instrumental variable 2 steps GMM (generalized methods of moments) as it is more efficient than the simple IV estimator because the standard errors of the estimation are robust to arbitrary heteroskedasticity and autocorrelation, Baum, Schaffer and Stillman (2003)[10]

Since the exchange rate regime is a dummy endogenous regressor, we prefer instrumentalise it by its fitted values from a logit model estimate. Exchange rate regime is regressed on a set

[10] Unlike some recent papers on exchange rate regime and inflation performance, see De Grauw and Schnabl (2008), this paper does not use the first difference and system Arellano-Bond (1991) or Blundell-Bond (1998) system GMM estimator. One important reason is that these estimators perform better when the dependent variable is moderately persistent. However, in our dataset the lagged dependent variable, although significant, is notably more persistent than in studies of De Grauw and Schnabl . Also, the dataset here does not meet the "short time period, many cross sections" criteria.

of conveniently related variables. The logit regressions are shown in Tables (from 6.1 to 6.3) of the Appendix.[11]

The consistency of I-V does not require the endogenous variable(s) to be continuous.[12] This preference, however, is motivated by the difficulty to find adequate instruments that are stationary, with sufficiently data availability and especially not related to inflation. While predicted values issued from logit estimation provides us, however, by a nearly ideal instrumental that is easily available, highly correlated with the endogenous regressor and plausibly exogenous.

After choosing our instrument, we test for the endogeneity of exchange regime to inflation by including exchange regime dummy as an endogenous variable and we test for the exogeneity (orthogonally) of lagged inflation rate, money supply, real GDP growth rate and openness to trade. The C (GMM distance) test[13] reported with the XTIVREG2 routine in STATA indicates us on the endogeneity of regressors and/or the validity of a subset of orthogonality conditions under the null hypothesis that the specified endogenous regressors can actually be treated as exogenous. The C-test can not reject its null that *de jure* IMF fixed exchange rate regime may be treated as exogenous at 23%. In contrast, it rejects the null of exogeneity for the case of RR and LYS *de facto* classifications at 6% and 2% respectively. The C orthogonality test for the previous set of suspect regressors suggests that they can be treated as exogenous. Given these test results, exchange rate regime dummy is treated as endogenous to inflation rate.

We also test for the relevance of our instrument. The test statistic proposed by Stock and Yogo (2005) is the F-statistic form of the Cragg and Donald (1993) statistic. [14] The null

[11] We test for a set of different specifications (not reported here). The final specifications reported in tables & make use only of statistically significant term. Particular attention is done to data with sufficient time series-cross section observations.

[12] Provided that a linear model is used to generate first-stage predictions of the endogenous dummy variable from these nonlinear fitted values and all other exogenous covariates in the second-stage equation, fitted values from a nonlinear model may still be used as an instrument for an endogenous dummy variable. There is thus no danger of misspesification or inconsistent estimate of our dummy variable coefficient, Kelejian, (1971); Angrist and Krueger (2001)

[13] This test statistic is distributed as χ^2 with degrees of freedom equal to the number of regressors tested, Baum (2003, 2007).

[14] Sotck and Yogo(2005) tabulate the critical value of Andersson F statistic which are supported in xtivreg2 software in STATA. This gives the value of test statistic below which the bias from possibly weak instrument exceeds a certain rate r (30, 20, 10 and 5%). The true rejection rate should be the standard 5%. Weak instruments are defined as instruments that will lead to a rejection rate of r. In all our regression the test statistics indicates a bias of well under 5%.

hypothesis being tested is that the estimator is weakly identified in the sense that it is subject to bias that the investigator finds unacceptably large, Baum (2007)
Besides, an older rule of thumb proposed by Staiger and Stock is to look on at the value of the F statistics in the first stage regressions of the endogenous variables on the instruments: if the F statistics is at least 10, the instruments can be deemed strong. Both tests indicate that our instrument is strong.

4.3 Results and Analysis

The regression results for *de jure* IMF; *de facto* classifications of RR and LYS are shown in tables (7.1,7.2, and 7.3) respectively. We began our analysis with pooled OLS estimation of the baseline model, column 1. Column 2 reports results for fixed effects estimate. FGLS estimation results are presented in column 3. Column 4 portrays the results obtained from fixed effects IV/GMM estimate after controlling for exchange regime endogeneity.

The coefficients of the lagged dependent variable are high (close to 0.8 in some cases) as well as highly significant.[15] Almost all other explanatory variables are significantly associated with inflation rate. Growth rate of money is positively associated with inflation. Each increase by one percentage point in the rate of money growth is associated with an increase by roughly 1 percentage in inflation rate. Real GDP growth rate is negatively correlated with inflation, even though is statistically insignificant in some cases. This finding is in line with large variety of monetary theory and consistent with many empirical studies. Figure (3) show a positive association between average growth rate of money and average inflation rate.

Openness to trade variable is found to be positively, not negatively, associated to inflation rate. This finding is not in line with Romer's (1993) prediction but rather with Alfaro (2005). We think that this positive effect may reflect other channels through which openness affects inflation, like higher pass through. As it is expected that, the more open appears the country, the more exchange rate movements are transmitted through import prices to CPI changes.

[15] This might be caused by lower credibility of monetary policy or/and uncertainty concerning economic development and geopolitical changes in the region.

Regarding real oil price shock, it is found to be significantly and negatively correlated to inflation rate. This suggests that inflation decreases following a rise in oil prices [16] which may du to the favourable impact of an increase in non-oil production, a tight monetary policy, and even more an effective expenditure management on inflation rate. In other world, since most countries in our sample are oil-exporting countries, an increase in oil prices will raise foreign reserve receipts, providing government with more income to finance investment projects without inducing budgetary deficit which, in turn, can help raise potential output growth rate and thus reduce inflation.[17] Nevertheless, an increase in oil's prices is expected to negatively impact net oil importing countries. However, until more recently most MENA countries subsidize domestic oil prices shielding hence the production sector of the economy. The fiscal tension induced by this subsidies and its effects on inflation depends on how persistent is this shock. In addition, high oil prices may carry benefit as well because of enhanced official foreign exchange receipts from financial inflows like remittances, foreign direct investment from Gulf countries increasing hence demand on domestic currency. Figure (4) shows positive correlation between oil price shock and real growth in MENA over the period 1980-2007.

The effects of fixed exchange rate regime are, instead, much less clear cut. Only *de facto* RR fixed exchange rate regime is robustly negative and significant in all models.
The coefficient of *de jure* fixed exchange regime is negatively correlated with inflation rate although insignificantly in the OLS and FGLS specification and positively related to inflation under the IV/GMM estimation. It seems that the signalling effect of fixed exchange rate regime was not effective in reducing inflation. The coefficient estimate of *de facto* (LYS) fixed exchange holds also a negative sign but is not significant except when exchange rate regime endogeneity has been taken in account.

In brief, our main finding on the link between fixed exchange rate regime and inflation reveals that the *de facto* fixed exchange rate regime and not the *de jure* one contributes significantly to lower inflation rate pointing out a

[16] Oil price increases may lead to a rise in inflation rate, however its effects is not instantaneous. re-estimation the equation for different lag for real oil price shocks reveal that oil prices increase need some time (two years, according to our estimations) to materialize into higher inflation rate.
[17] This conclusion also holds when interaction terms between real oil price shock and dummy for oil exporting and oil importing countries are entered in the regression model (not shown here). Both interaction terms hold a negative sign. However, the impact of positive oil shocks (a rise in prices) was only significant when oil exporting countries is considered.

credibility problem. Even more, among *de facto* measures of fixed rate, this of RR measure tends to lend more support for stabilization effect of fixed exchange rate regime.
It worth mentioning here that differences in the significance of results between both *de facto* classifications employed here reflect some diversity in outcome measures.[18] For example, Levy-Yeyati and Sturzenegger (2005) compute the volatility of reserves and nominal exchange rate, and then use cluster analysis to group countries in five categories. According to their method, a one period devaluation causes a break in the peg as the changes in exchange rate relative to the changes in reserves is gauged as being too large to be considered as a peg inducing hence a large number of regime switches.

In turn, Reinhart and Rogoff (2004) focus on the volatility of the nominal exchange rate and on the conditional probability of the exchange rate staying within a given range over a rolling five-year window making it difficult to compare it with other classifications. They also break out countries that have dual or multiple exchange rates as a separate category. So for the average exchange rate volatility, devaluation can occur without breaking the peg inducing hence longer lived fixed exchange rate regimes than in the case of LYS classification.

Yet, since we are interested in MENA region where multiple exchange rates system were widely widespread (e.g. Algeria, Iran, Syria, Egypt, Turkey, Libya, Yemen),[19] the RR classification would be more adequate reflection of the *de facto* exchange rate policies. However, two particular limitations have been evocated here by Bleaney and Francisco (2007) and Shambaugh (2004). The first one is related to the identification of floating regime. It occurs that Reinhart and Rogoff, while using nominal exchange rate as the principal variable of identification, takes also account of high inflation countries which may produce results working against floating exchange rate regime, (e.g. it is more likely to classify a country as having a floating exchange regime if its domestic inflation rate was over 25% than if it was under 25%, or as having a free falling regime if its inflation rate was over 40% in at least one year in the period study).

[18] See for example Bleaney and Francisco (2007), Klein and Shambaugh (2007) how discuss this issue in more detail.
[19] A large part of economic transaction is done at the parallel market rate, as it is more advantageous. Moreover, parallel rates tend to be most volatile when there is a large parallel-market premium, which is often an indicator of inconsistent monetary and exchange rate policies. For example, the average premium for the period 1980-1996 was 270% in Algeria, 70% in Egypt, 3.8% in Morocco and 5.6 %in Tunisia. The multiplicity of exchange rate regimes has been reduced remarkably these recent years du to the exchange rate policy reforms and trade liberalisation.

We touch on this bias reporting as missing cases of high inflation free falling exchange rate regime where weak institutions would simultaneously explain poor inflation performance indeed to the choice of floating exchange rate regime (because high inflation makes a sustained fixed exchange rate impossible).

The coefficient of the fixe dummy is still highly significant and of the expected sign. The only contrast to the previous results is that now the coefficient of the peg appears to be insignificant in the IV estimation. However, Stock and Yogo (2005) statistics indicates a weak instrument problem with a bias of 15% compared to OLS estimates.

The second limitation concerns countries classified *de facto* as having a flexible rate because their parallel (black) markets rates were volatile. This issue will be of special interest when one studies inflation performance of peg since the country makes no declaration or attempt to control for parallel market rate stability. This country is more similar to one that has stabilized its official exchange rate via restriction on trade and other capital control mechanism.

A deeper question intrude in this regard, however, is to whether capital control represents a deviation of the peg? If one need indeed to consider monetary constraint imposed by the fixed exchange regime, this case would be relevant in countries with no capital control as the monetary policy will be devoted to exchange rate management.

In several MENA countries, dual and multiple exchange rates have been used as a form of back- door floating and they were usually accompanied by strong capital control. Policy makers are not constrained in their managements of the monetary policy. They may be concerned not only about inflation as a policy goal (even when it is initially high) but they are also occupied with the need to reduce unemployment and to boost growth therefore might find it optimal to mimic the action of more inflation-averse policymakers to build reputation no matter whether this announced policy were carried out.

4.4 **Robustness Analysis:** words vs. deeds classification of Exchange Rate Regimes

Our previous results show that RR and LYS *de facto* fixed exchange regimes were significantly associated with lower inflation rate in contrast to the *de jure* fixed exchange

regime that did not exhibit any significant relationship with inflation. This results for *de jure* IMF classification may be a logical consequence of the fact that this classification does not distinguish between credible and non credible pegs, and thus includes within the fixed group countries that fail to comply with commitment because of inconsistent monetary policies. Such failure may derive expectations of potential devaluation, leading to high inflation rate and eventually to the collapse of the peg. In this latter regard, the credibility of fixed exchange rate and the implication of policy deviation from the announcement regime on inflation outcome is a cause of concern.

Potential causes and policy implications of such differences between *de jure* and *de facto* regimes have been discussed in the literature. Models in the Barro-Gordon point to the anti-inflationary gain from credibly fixing the exchange rate to a nominal anchor. However, credibility of pegged policies was often threatened as countries are likely to have difficulty in maintaining a time consistent policy especially when the underlying fundamentals do not support the regime choice.

Alesina and Wagner (2006) stipulate, linking exchange rate policies to the overall institution quality, that pegged regimes are very demanding and require good institutions able to ensure the credibility and the sustainability of the fixed rate. In consequence, countries with weak institution would be more likely to announce a fixed exchange regime and then forced to abandon it. It would be thus better for countries with weak institutions to declare a floating exchange regime while intervene heavily. A similar argument was provided by Genberg and Swoboda (2005) who suggest that *de jure* declared regime does not reflect the true goals of actual intent of the policy. Government may be reluctant to commit it self to fixed rate in order to retain some flexibility face to shock or simply to elude the speculative currency attacks the announcement of pegs often invite.

Barajas, Erickson and Steiner (2008) view fear of floating as fear of declaring. The declaration in it self is consequential as public monitor policy maker's action and hold them accountable if their actions (*de facto*) were not in line with the announced (*de jure)* commitment. The cost of inconsistency will be higher under *de jure* fixed regimes than under *de jure* floating regimes where there is no such commitment. The problem of reputation becomes hence less important providing certain room of manoeuvre to react to periods of crisis and weak economic growth.

In an attempt to examine the review's thoughts evocated above and to check the implication of each word deviation from the deed policy on inflation, we proceed naturally in matching *de jure* announcements (words) to *de facto* policies (deeds), that is, both *de facto* RR and LYS. This yields four categories characterized as follow:

Credible peg (fixed) regime (J_fix-F_fix) where the commitment *de jure* and the behavior *de facto* were observed, (example, GCC countries, Morocco, Jordan, Lebanon in the late 1990s).

Fear of pegging (J_fix-F_flex): where *de jure* commitment to fixed rate is announced while *de facto* regime is more flexible. This case was observed in the 1980s when several countries in MENA confronted with disruptive macroeconomic condition that required higher degree of flexibility to deal with. This was especially the case of Syria, Libya, Algeria, Egypt and Jordan.

Fear of float (J_float-F_fix): where the country declares a floating regime while follows unofficial exchange rate target. This situation has been widespread in the 1990s and 2000s (for example: Egypt, Algeria, and Tunisia).

Consistent floating regime (J_float-F_float), when nominal exchange rate variability is consistent with the announced floating regime. (For example, Turkey, Yemen).

We re-estimate then our baseline specification by substituting fixed exchange rate by three dummies representing categories specified above with consistent floating regime being the omitted category. Each dummy equals to 1 if data-year observation fall in the specified category and 0 otherwise.

Figure 5 and 6 plot country inflation observations against theses four categories with median inflation rate reported in parentheses. The salient feature is that median inflation rate differs markedly across regimes. It ranges from 2.5% under credible fixed regime to nearly 12 % for floating regime when IMF vs. RR case is considered and from 3% to 9% in IMF vs. LYS case. Credible peg and fear of floating regimes report together the lower rate of inflation. However, inflation is much lower under the credible peg category than under the fear of floating category.

Results from our robustness test, presented in table (7), reveal some valuable information.

First, results point out important differences when comparing credible peg and non credible peg regimes. A credible commitment to fixed rate, words backed by actions, serve significantly to lower inflation by directly influencing inflation expectations providing a

relatively clear cut test of the reputation role of meeting policy announcement on inflation performance. This result is in line with this of Guisinger and Singer (2010).[20] By contrast, reneging on announcement of fixed exchange rate regime was not significantly linked to inflation.

Second, countries that fix *de facto* but not *de jure* (the fear of floating category) enjoy indeed low inflation rate. The coefficient estimates for fear of floating category holds a negative significant sign but only when *de jure* IMF is compared to *de facto* RR. This finding provides an empirical support to Alesina and Wagner (2006) hypothesis.[21]

Third, fixed effects estimators reduce almost all the coefficient of exchange regimes dummies to non significance. One of the reasons is that fixed effect uses only the within variance for the estimation and disregards the between variance, it does not hence allow the estimation of time invariant variables (Baltagi 2001; Wooldridge 2002; Hsiao 2003). This wipes up of our sample the GCC countries who maintain *de jure* pegs to the US dollar that had already *de facto* been in place for long time. In this regard, FGLS estimator allows theses countries to contribute to the determination of the coefficient estimates reflecting hence between country variations, see Plumper and Troeger (2007)

5. Conclusion

In this paper we have empirically tried to asses the relationship between exchange rate regimes and inflation performance for 17 MENA countries over the period 1980-2007. Using various exchange rate classifications and controlling for macroeconomic variables, that are conventionally associated to inflation, we find that *de jure* fixed exchange regime alone does not contribute to lower inflation rate however; it plays a significant role in anchoring expectation and improving credibility and hence reducing inflation when it is backed by *de facto* consistent behavior. Considering *de facto* pegs regimes they were strongly associated with lower inflation. Theses results still hold even after addressing potential endogeneity concern. In addition countries who seeking exchange rate stability while avoiding speculation

[20] Levy-Yeyati and Sturzengger, (2001) show that credible peg helps reduce inertial inflation and inflation rate by placing a limit to devaluation expectations which might stabilize money velocity and reduce the sensitivity of prices to temporary monetary expansions.

[21] It may be crucial to flexible exchange rate system to be credible here as letting exchange rate fluctuate may feeds back into inflation through its impact on either financial fragility and the pass through from depreciations, De Gregorio and Tokman (2004).

attacks by adopting a fear of floating behavior yields broadly similar results as those of *de facto* pegged regime.

References

Aghevli, B. B., Mohsin K., and Peter J. M., (1991). *Exchange Rate Policy in Developing Countries: Some Analytical Issues*, IMF Occasional Paper, No. 78.

Aizenman, J., and Glick, R., (2007). *Pegged Exchange Rate Regimes – A Trap*, Journal of Money, Credit & Banking. http://economics.sbs.ohio-state.edu/jmcb/jmcb/06069/06069.pdf

Alesina, A. and Wagner, A.F., (2006). *Choosing (and reneging on) Exchange Rate Regimes*, Journal of the EEA No.4, PP. 770-799.

Alfaro, L., (2005). *Inflation, Openness, and Exchange-Rate Regimes: The Quest for Short-Term Commitment*, Journal of Development Economics, Vol.77, No.1, P.229-249.

Angrist, D. J., and Krueger , B.A., (2001). *Instrumental Variables and the Search for Identification: From Supply and Demand to Natural Experiments*, Journal of Economic Perspectives,Vol. 15, No.4, pp. 69–85

Angrist, J.D., and Krueger, A.B., (2001). *Instrumental Variables and the Search for Identification: From Supply and Demand to Natural Experiments*, Vol. 15, No. 4, PP: 69-85

Barajas, A., Erickson, L., and Steiner R., (2008). *Fear of Declaring: Do Markets Care What Countries Say About Their Exchange Rate Policies*? IMF Staff Paper, Vol.55, No.3, PP. 445-480.

Barro, R.J., Gordon, D., (1983). *Rule, Discretion and Reputation in a Model of Monetary policy*, Journal of Monetary Economics, Vol. 12, No.1, PP. 101-121.

Barro, R.J., 1997. “Macroeconomics”, Massachusetts Institute of Technology

Baum C.F., Schaffer, M.E., and Stillman, S., and Stillman S., 2003. “Instrumenting Variables and GMM Estimation and Testing”, Working Paper No. 545, Boston College , Departemnt of Economics.

Baum C.F., Schaffer, M.E., and Stillman, S., (2007) database, *IVREG2: Stata Module for Extended Instrumental Variables/2SLS and GMM Estimation*, available from <http://econpapers.repec.org/software/bocbocode/s425401.htm>.

Bleaney, M., (1999). *The Disappearing Openess-Inflation Relationship: A Cross-Country Analysis on Inflation Rates*, IMF Working Paper, No. 161.

Bleaney, M. and Fielding, D., (2002). *Exchange Rate Regimes, inflation and Output volatility in Developing Countries*, Journal of Development Economics, Vol. 68, PP. 233-245.

Bleaney, M. and Fielding, D., (2002). *Classifying Exchange Rate Regimes: A Statistical Analysis of Alternative Methods*, Economic Bulletin, Vol. 6, No. 3, PP. 1-16.

Bleaney, M. and Francisco., M. (2005), *Exchange Rate Regimes and Inflation: Only Hard Pegs Make Differences*, Canadian Journal of Economics, Vol. 38, No. 4, pp. 1453-1471.

Bond, S., (2002). *Dynamic panel data models: a guide to micro data methods and practice*, Portugese Economic Journal Vol.1, PP. 141-162.

Breusch, T., and Pagan, A., (1980). T*he LM Test and its Application to Model Specification in Econometrics*, Review of Economic Studies, No: 47, PP. 237-254.

Calvo, G.A., and Reinhart C.M., (2002). *Fear of Floating*, Quarterly Journal of Economics, Vol. 117, No. 2, P. 379-408

Cragg, J. G., and Donald, S. G., (1993). T*esting Identifiability and Specification in Instrumental Variable Models*, Econometric Theory, Vol. 9, No.2.

Drukker, D., Porqueras, P.G, and Verme, P. H., (2005). *Threshold Effects in the Relationship Between inflation and Growth: A New Panel-Data Approach*, Working Paper.

De Grauwe, P. and Schnabl. G., (2004), *Exchange Rate Regimes and Macroeconomic Stability in Central and Eastern Europe*, CESIFO Working paper, Vol. 6, No: 1182.

De Grauwe, P. and Schnabl. G., (2008), *Exchange Rate Stability, Inflation, and Growth in (South) Eastern and Central Europe*, Review of Development Economics, Vol.12, No. 3, PP. 530–549.

De Gregorio, J. and Tokman, A., (2004). *Overcoming fear of floating: exchange rate policies in Chile*, Mimeo, Central Bank of Chile.

Domac, I., Peters, K. and Yuzefovich, Y., (2004a). *Does the Exchange Rate Regime Matter for Inflation?Evidence from Transition Economies*, Policy Research Working Paper, PP. 1-29.

Edwards, S., (1996). *The Determinants of the Choice between Fixed and Flexible Exchange-Rate Regimes*, NBER Working Paper No. 5756

Eichengreen, B., and Hausmann, R., (1999). *Exchange Rates and Financial Fragility*, NBER working paper, No. 7418

Genberg, H. and Swoboda A.K., (2005). "Exchange Rate Regimes: Does What Countries Say Matter?", IMF Staff Papers No.52, PP. 129-141.

Giavazzi, F. and Giovannini, G., (1989). *Limiting Exchange Rate Flexibility*, Cambridge: The MIT Press.

Ghosh, A, Gulde , A-M, Ostry, J and Wolf, H., (1996). *Does the Exchange Rate Regime Matter for Inflation and Growth*? IMF Working Paper , No. 2, PP. 1-19.

Ghosh, A, Gulde , A-M, Ostry, J and Wolf, H., (1997). Does *the Nominal Exchange Rate Regime Matter*?" NBER Working Paper No. 5874

Ghosh, A, Gulde , A-M, Ostry, J and Wolf, H., (1998). *Currency Boards: The Ultimate Fix*? IMF Working Paper No 8.

Ghosh, A, Gulde , A-M, Ostry, J and Wolf, H., (2000). *Currency boards: More than a quick fix*?, Economic Policy, No. 31, PP. 270-335.

Ghosh, A, Gulde , A-M, Ostry, J and Wolf, H., (2002). *Exchange Rate Regimes: Choices and Consequences*, Cambridge and London: MIT Press.

Gordon, R., J, (1984). *Supply Shocks and Monetary Policy Revisited*. *American Economic Review*. May, Vol.74, No. 2. PP.38-43

Guisinger A. and Singer D.A., (2010). *Exchange Rate Proclamation and Inflation Fighting Credibility*, International Organization, Vol. 64, No. 2, PP. 313-337

Im, K.S., Pesaran, S.H. and Shin, Y., (2003). T*esting for Unit Roots in Heterogeneous Panels*, Journal of Econometrics, Vol. 115, No. 1, PP. 53–74.

Judson, R., A, and Owen, A.L., (1999). *Estimating Dynamic Panel Data Models a Guide for Macroeconomists*, Economics Letters, Vol.65, No.1, PP. 9-15.

Khan M. and Senhadji, S., (2000). *Threshold Effects in the Relationship Between Inflation and Growth: An Overview*, IMF Working Paper, N. 109.

Kelejian, H. H., (1971). *Two-Stage Least Squares and Econometric Systems Linear in Parameters but Nonlinear in the Endogenous Variables*, Journal of the American Statistical Association, Vol. 66, No. 334, PP. 373–374.

Klein, M. W., and Shambaugh, J.C., (2007). *The Dynamics of Exchange Rate Regimes: Fixes, Floats, and Flips*, Journal of International Economics, doi: 10.1016/j.jinteco.2007.10.003.

Kmenta, J., (1986). *Elements of Econometrics*, Macmillan, Newyork, NY.

Levy Yeyati, E. and Sturzenegger, F, (2000). *Exchange Rate Regimes and Economic Performance*. Paper presented at the first IMF Research Conference (Washington, DC, 9-10 November), Special Issue. 47, PP. 62-95. Available from: http://citeseer.ist.psu.edu/cache/papers/cs/28727/http:zSzzSzwww.utdt.eduzSz~fsturzenzSzls.pdf/levy-yeyati01exchange.pdf

Levy-Yeyati , E., and Sturzenegger, F. (2005). *Classifying Exchange Rate Regimes: Deeds vs. Words*, European Economic Review, Vol. 49, No. 6, PP. 1603-1635.

Maddala, G.S., and Wu, S., (1999). *A Comparative Study of Unit Root Tests With Panel Data and A New Simple Test*, Oxford Bulletin of Economics and Statistics No: 61, PP. 631-652.

Moreno, R., (2001). P*egging and Stabilization Policy in Developing Countries*, Economic Review of the Federal Reserve Bank of San Francisco, Vol. 12, No. 99, PP. 17-29.

Neaime., S., (2008). *Monetary Policy and Transmission and Targeting Mechanisms in the MENA Region*, Working Paper No. 395, Economic Research Forum, October 24th -25th 2008, Tunisia.

Nickell, S.J., (1981). *Biases in Dynamic Models with Fixed Effects*, Econometrica, Vol. 49, No. 6, PP. 1417-1426.

Obstfeld, M., and Rogoff, K., (1995). *The Mirage of Fixed Exchange Rates*, Journal of Economic Perspectives, Vol. 9, No. 4, PP. 73-96.

Plumper, T., and Troeger, V.E., (2007). *Efficient Estimation of Time-Invariant and Rarely Changing Variables in Finite Sample Panel Analyses with Unit Fixed Effects*, Political Analysis? Vol.15, No.2, PP. 124-39.

Reinhart, C. M., and Rogoff, K. S., (2004). *The Modern History of Exchange Rate Arrangemnts: A Reinterpretation*, Quarterly Journal of Economics, Vol. 119, No.1, PP. 1-48

Rogoff, K.A., Husain, A.M., Mody, A., Brooks, R., and Oomes, N., (2003). *Evolution and Performance of Exchange Rate Regimes*, IMF Working Paper, No. 243.

Roodman, D. 2004, 'ABAR: Module to Perform Arellano-Bond Test for Autocorrelation', available at <http://ideas.repec.org/c/boc/bocode/s437501.html>.

Roodman, D., (2006). *How to Do xtabond2: An Introduction to "Difference" and "System" GMM in Stata*, Center for Global Development Working Paper , No. 103.

Romer, D., (1993). *Openness and Inflation : Theory and Evidence*, Quarterly Journal of Economics, No. 108, PP. 1111-46

Shambaugh, J., C. (2004). *The Effect of Fixed Exchange Rates on Monetary Policy*, Quarterly Journal of Economics, Vol. 119 , No.1, PP. 301-52.

Siklos, P. L., (1996). *The Connection between Exchange Rate Regimes and Credibility: An International Perspective*, Exchange Rates and Monetary Policy, Proceedings of a conference held by the Bank of Canada.

Staiger, D., and Stock, J. H., (1997). *Instrumental Variables Regression with Weak Instruments*, Econometrica Vol. 65, No. 3, PP. 557-586.

Stock, J. H., and Yogo, M., (2005). *Testing for Weak Instruments in: Linear IV Regression, inIdentification and Inference for Econometric Models: Essays in Honor of Thomas J. Rothenberg*, Cambridge University Press.

Tomell, A., and Velasco, A., (2000). *Fixed Versus Flexible Exchange Rates: Which Provides more Fiscal Discipline*?, Journal of Monetary Economics, Vol. 45.

Vuletin, J. G., (2004). *Exchange Rate Regimes and Fiscal Performance: Do Fixed Exchange Rate Regimes Generate More Discipline than Flexible Ones*? North American Winter Meeting of the Econometrics Society, Working Paper, No. 474.

Sargent, T., and Wallace, N., (1981), *Some Unpleasant Monetarist Arithmetic*. Federal Reserve Bank of Minneapolis, Quarterly Review, Vol. 5, No.3, PP. 1-17.

Wooldridge, J.M., (2002). *Econometric Analysis of Cross Section and Panel Data*, MIT Press.

APPENDIX

Figure 3

Inflation and Money Growth

Average, (1980-2007)

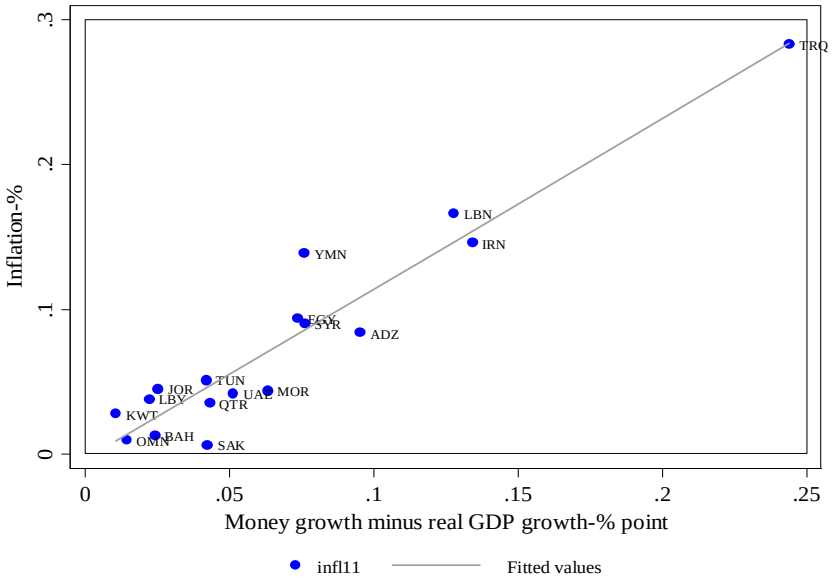


Figure 4

Changes in Real Oil Price and Mean Real Growth Rate

(1980-2007)

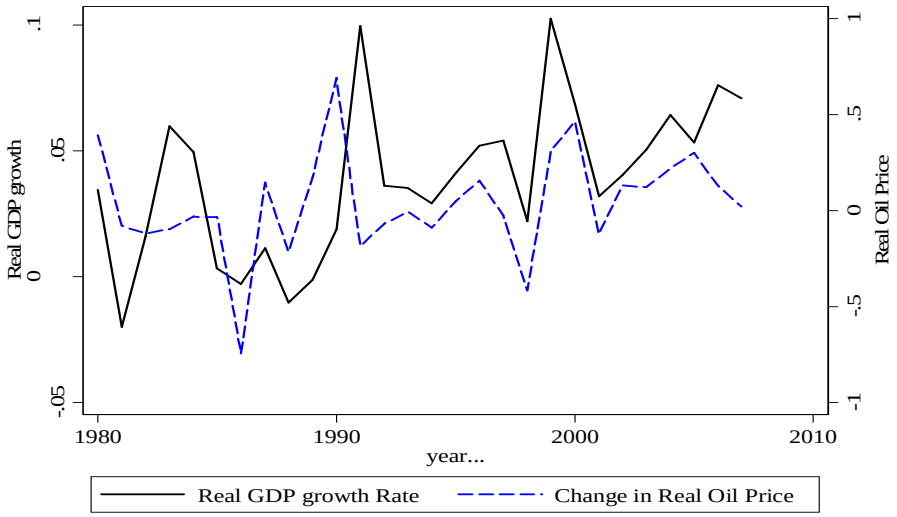
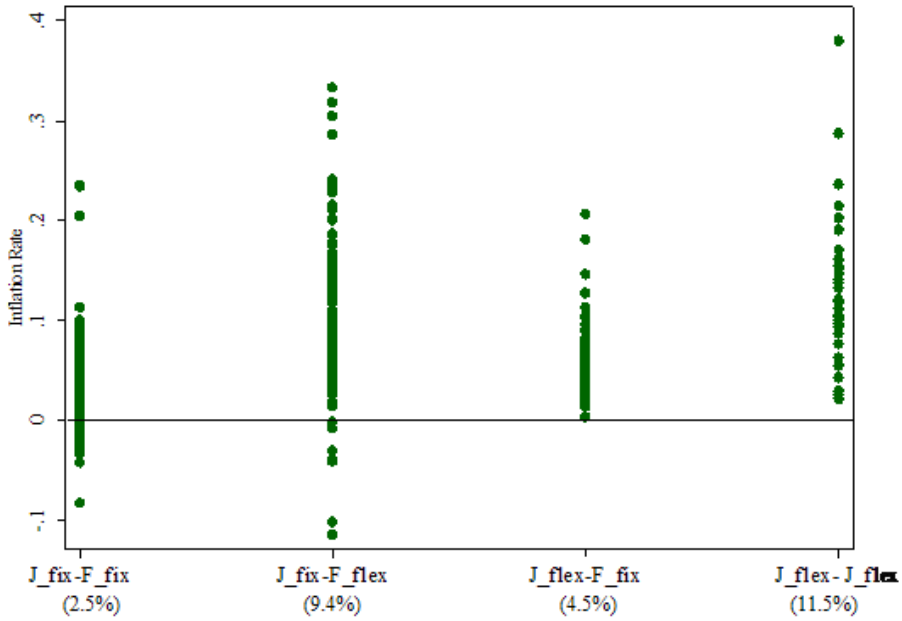


Figure 5

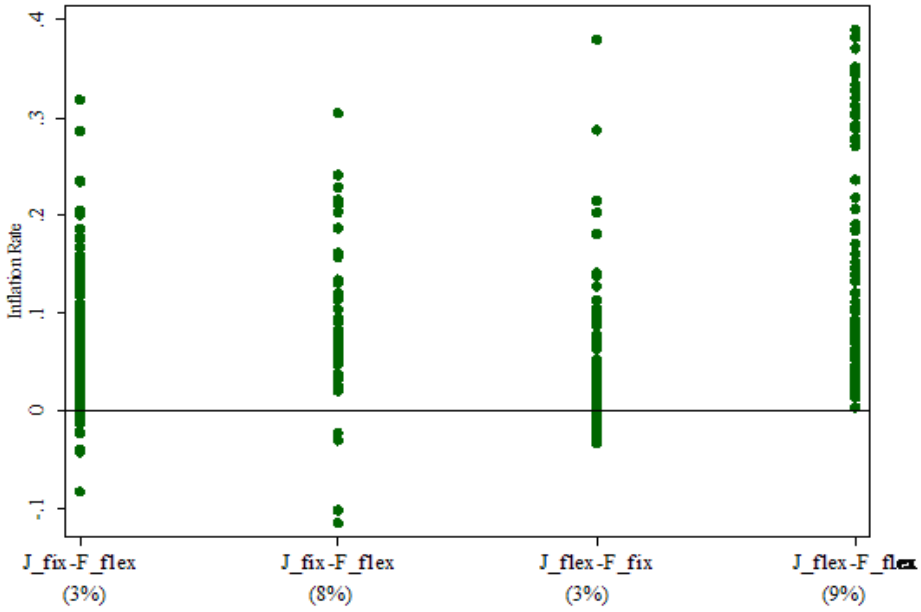
Country- year inflation observations across exchange rate regimes (IMF vs.RR, 1980-12007)



Note: *median inflation rate is reported in parentheses*

Figure 6

Country- year inflation observations and median inflation rate across exchange rate regimes (IMF vs.LYS, 1980-12007)



Note: *median inflation rate is reported in parentheses*

Table (1) Various Exchange Rate Classification and Sources

IMF	**Fix:** Conventional Peg, Peg to Signal Currency, Peg to Composite of Currencies **Flexible**: Crawling Peg, Crawling Band, Limited Flexibility, Horizontal bands, Managed Float, Independent Float .	International Financial Statistics, Exchange Arrangements and Exchange Rate Restrictions (IMF, annual publication). From 2003 to 2007 data taken from Classification of Exchange Rate Arrangements and Monetary Framework at http: //www.imf.org/ external/ np/ mfd/er /index
RR	**Fix**: Pre announced peg or currency board arrangementde, Pre announced horizontal band that is narrower than or equal to +/-2%, De Facto Peg, Pre announced crawling peg, Pre announced crawling band that is narrower than or equal to +/-2%, De factor crawling peg, De facto crawling band that is narrower than or equal to +/-2%. **Flexibl**e: Pre announced crawling band that is wider than or equal to +/-2%, De facto crawling band that is narrower than or equal to +/-5%, Managed Float, Freely Falling , Independent Float	Data is taken from Reinhart and Rogoff classification available at: http://www.puaf.umd.edu.faculty/papers/reinhart/reinhart
LYS	**Fix:** Fixe, Inconclusive **Flexible**: Dirty Crawling Peg, Float, Dirty Float	Data is taken from Levy Yeyati-Sturzenegger classification available at: http://FD_Database_new.xls de profesores.utdt.edu/~ely/papers.html

Table (3) Data Definition and Sources

Dependent Variable		**Source**
Inflation rate	Difference in log of CPI adjusted to reduce outlier	IFS/IMF
Independent Variables		
Real GDP	Difference in log of real GDP at constant 2000 prices in local currency units	IFS/IMF
Money supply	Difference in log of M1 in nominal local currency adjusted for outlier	IFS/IMF
Openness to trade	Exports plus imports of goods in current local currency and services to GDP	IFS/IMF
Oil price shock	Difference in log of nominal oil price (average spot oil-price of Brent, Taxes, and Dubai in US$) converted to local currency using nominal exchange rate with the US dollar, and then deflated with the respective country's CPI	IEA
Instrument List		
Natural logarithm of population size		WDI
Manufactured export to GDP		WDI
Debt service to GDP		WDI
Liquid liability to GDP		WDI
Net foreign asset to GDP		IFS/IMF
Net foreign reserve minus gold to import		IFS/IMF

Note: *WB: World Bank; IMF: International Monetary Fund; IFS: International Financial Statistics; IAE: International Energy Agency*

Table (4) Summary Statistics

Variables	Obs.	Mean	Median	Std.Dev.	Min	Max
Inflation Rate	465	.0757707	.0453815	.0952612	-.1149631	.6388962
Money Supply	465	.1070239	.1017358	.1087135	-.5168854	.737343
Real GDP	463	.0394014	.0438601	.1219862	-.8807067	1.35214
Openness to trade	455	.8100285	.7337911	.3901076	.1330336	2.674068
Oil price shock	465	.0392321	.0149218	.5003468	-1.016129	8.58059

Table (5) Pair wise correlation Matrix

	$\pi_{i,t}$	$ERR_{i,t}$	$M1_{i,t}$	$GDP_{i,t}$	$OPEN_{i,t}$	$Oil_{i,t}$	*Time-dum*
$\pi_{i,t}$	1.0000						
$ERR_{i,t}$	-0.3874	1.0000					
$M1_{i,t}$	0.5851	-0.3037	1.0000				
$GDP_{i,t}$	-0.1066	-0.0012	-0.0070	1.0000			
$OPEN_{i,t}$	-0.3214	0.2371	-0.1934	0.0848	1.0000		
$Oil_{i,t}$	-0.1157	0.0147	0.1021	0.0919	-0.0093	1.0000	
Time-dum	0.2293	0.0373	-0.1042	-0.0991	-0.0713	-0.1006	1.0000

Table (6.1) IMF-*de jure* Prediction

Number of observation = 421
Wald chi2(4) = 90.77
Prob > chi2 = 0.0000
Pseudo R2 = 0.1781

Fixe	Coef.	z	P>|z|
lagged openness to trade	0.9044728	2.05	0.041
liquid liability to GDP	1.542737	2.84	0.004
log of real GDP	1.069818	7.11	0.000
net foreign asset to GDP	-1.562257	-3.94	0.000
_cons	-8.563041	-6.88	0.000

-------- True --------

Classified	D	~D	
+	300	92	392
-	17	12	29
Total	317	104	421

Classified + if predicted Pr(D) >= .5 defined as z1 != 0		True D
Sensitivity	Pr(+| D)	94.64%
Specificity	Pr(-|~D)	11.54%
Positive predictive value	Pr(D| +)	76.53%
Negative predictive value	Pr(~D| -)	41.38%
False + rate for true ~D	Pr(+|~D)	88.46%
False - rate for true D	Pr(-| D)	5.36%
False + rate for classified +	Pr(~D|+)	23.47%
False - rate for classified -	Pr(D| -)	58.62%
Correctly classified		74.11%

Table (6.2) RR-*de facto* Prediction

Number of observation = 433

Wald chi2(3) = 119.33

Prob > chi2 = 0.0000

Pseudo R2 = 0.2303

Fixe	Coef.	z	P>|z|
lagged foreign reserve to import	0.6900328	1.91	0.056
liquid liability to GDP	7.635288	1.74	0.082
population size	-0.8988375	-10.84	0.000
_cons	8.405291	11.27	0.000

-------- True --------

Classified	D	~D	
+	233	65	298
-	55	80	135
Total	288	145	433

Classified + if predicted Pr(D) >= .5 defined as z1 != 0		True D
Sensitivity	Pr(+| D)	80.90%
Specificity	Pr(-|~D)	55.17%
Positive predictive value	Pr(D| +)	78.19%
Negative predictive value	Pr(~D| -)	59.26%
False + rate for true ~D	Pr(+|~D)	44.83%
False - rate for true D	Pr(-| D)	19.10%
False + rate for classified +	Pr(~D|+)	21.81%
False - rate for classified -	Pr(D| -)	40.74%
Correctly classified		72.29%

Table (6.3) LYS-*de facto* Prediction

Number of observation	=	418
Wald chi2(3)	=	100.98
Prob > chi2	=	0.0000
Pseudo R2	=	0.2920

Fixe	Coef.	z	P>|z|
manufactured exports to GDP	-6.679927	-2.29	0.022
population size	-0.2603862	-2.12	0.034
net foreign asset to GDP	5.437936	5.11	0.000
_cons	2.902758	2.86	0.004

	-------- True --------		
Classified	D	~D	
+	241	42	283
-	47	88	135
Total	288	130	418

Classified + if predicted Pr(D) >= .5 defined as z1 != 0		True D
Sensitivity	Pr(+| D)	83.68%
Specificity	Pr(-|~D)	67.69%
Positive predictive value	Pr(D| +)	85.16%
Negative predictive value	Pr(~D| -)	65.19%
False + rate for true ~D	Pr(+|~D)	32.31%
False - rate for true D	Pr(-| D)	16.32%
False + rate for classified +	Pr(~D|+)	14.84%
False - rate for classified -	Pr(D| -)	34.81%
Correctly classified		78.71%

Table (7.1) Results obtained with IMF *de jure* Classification

	OLS		**FE**		**FGLS**		**IV-GMM ***	
	Coef.	*P>|t|*	*Coef.*	*P>|t|*	*Coef.*	*P>|t|*	*Coef.*	*P>|t|*
$\pi_{i,t-1}$	.7560911 [16.76]	0.000	.6702077 [21.60]	0.000	.7910758 [32.91]	0.000	.6425689 [13.40]	0.000
$ERR_{i,t}$	-.0082021 [-1.60]	0.113	-.0004296 [-0.07]	0.941	-.0034401 [-1.01]	0.311	.0248534 [1.25]	0.210
$M1_{i,t}$	.1355301 [4.23]	0.000	.1262016 [5.67]	0.000	.0793652 [5.46]	0.000	.0933535 [3.20]	0.001
$GDP_{i,t}$	.0160666 [-0.79]	0.348	-.0200603 [-1.32]	0.186	-.0296009 [-2.73]	0.006	-.003084 [-0.22	0.824
$OPEN_{i,t}$	.0160666 [0.94]	0.348	.0200985 [1.62]	0.106	.0321734 [4.31]	0.000	.0402108 [3.24]	0.001
$Oil_{i,t}$	-.0130194 [-1.86]	0.063	-.0136034 [-2.16]	0.031	-.0093456 [-1.97]	0.049	-.0204472 [-3.45]	0.001
Time-dum	.0193119 [4.31]	0.000	.0223289	0.000	.009228 [3.50]	0.000	.0187759 [4.74]	0.000
N. obs	446		446		446		420	

Notes: t-values in parentheses.

, **, * indicate significance at the 10,5 and 1% significance levels respectively*

(*): The predicted probability obtained from logit regression on a set of regressors: lagged openness to trade, liquid liability to GDP, log of real GDP, net foreign asset to GDP. All instruments were tested for orthogonality.

The diagnostic tests show no evidence of under of overidentification. The Anderson canon. corr. LR (underidentification) statistic = 45.127Chi-sq(1) P-val = 0.0000

The Cragg-Donald F statistic is 46.921well above the range where it would imply any significant bias.

Table (7.2) Results obtained with RR *de facto* Classification

	OLS		FE		FGLS		IV-GMM *	
	Coef.	*P>|t|*	*Coef.*	*P>|t|*	*Coef.*	*P>|t|*	*Coef.*	*P>|t|*
$\pi_{i,t-1}$	.7182504 [14.30]	0.000	.6393632 [19.96]	0.000	.7402373 [27.74]	0.000	.5841064 [10.02]	0.000
$ERR_{i,t}$	-.0180459 [-3.05]	0.002	-.0251773 [-3.30]	0.001	-.0179214 [-4.17]	0.000	-.0527013 [-1.76]	0.079
$M1_{i,t}$	.1399653 [4.34]	0.000	.1269316 [5.79]	0.000	.0819547 [5.74]	0.000	.095873 [3,44]	0.001
$GDP_{i,t}$	-.0167154 [-0.92]	0.356	-.0216909 [-1.45]	0.148	-.0296024 [-2.68]	0.007	-.0145992 [-1.04]	0.300
$OPEN_{i,t}$	.0160033 [1.01]	0.315	.0202209 [1.65]	0.099	.0323986 [4.28]	0.000	.0283826 [2.42]	0.016
$Oil_{i,t}$	-.0139237 [-2.11]	0.036	-.0137931 [-2.22]	0.027	-.0093852 [-2.06]	0.039	-.0185847 [-3.10]	0.002
Time-dum	.0186006 [4.30]	0.000	.0206956 [5.19]	0.000	.0088261 [3.54]	0.000	.0148775 [3.58]	0.000
N. obs	446		446		446		431	

Notes: t-values in parentheses.

, **, * indicate significance at the 10,5 and 1% significance levels respectively*

(*): The predicted probability obtained from logit regression on a set of regressors: lagged foreign reserve minus gold to import, debt services to GDP and the size of population.

The diagnostic tests show no evidence of under of overidentification. The Anderson canon. corr. LR (underidentification) statistic = 22.547 Chi-sq(1) P-val = 0.0000

The Cragg-Donald F statistic is 22.780 well above the range where it would imply any significant bias.

Table (7.3) Results obtained with LYS *de facto* Classification

	OLS		FE		FGLS		IV-GMM *	
	Coef.	*P>|t|*	*Coef.*	*P>|t|*	*Coef.*	*P>|t|*	*Coef.*	*P>|t|*
$\pi_{i,t-1}$	.7602591 [16.26]	0.000	.6686172 [21.45]	0.000	.7906903 [32.70]	0.000	.6461029 [9.70]	0.000
$ERR_{i,t}$	-.0057682 [-1.02]	0.308	-.0030942 [-0.53]	0.598	-.0037463 [-1.24]	0.216	-.0510688 [-1.98]	0.051
$M1_{i,t}$	.1394084 [4.24]	0.000	.1265944 [5.71]	0.000	.0808322 [5.55]	0.000	.096809 [3,32]	0.001
$GDP_{i,t}$	-.0157953 [-0.84]	0.401	-.0207344 [-1.36]	0.173	-.0295048 [-2.68]	0.007	-.0375907 [-2.82]	0.005
$OPEN_{i,t}$	.0148424 [0.87]	0.387	.0199862 [1.61]	0.108	.0320149 [4.22]	0.000	.0392779 [3.45]	0.001
$Oil_{i,t}$	-.0142291 [-1.99]	0.047	-.0143385 [-2.22]	0.027	-.0094316 [-1.99]	0.047	-.0298805 [-3.37]	0.001
Time-dum	.0181618 [4.00]	0.000	.0219381 [5.38]	0.000	.0088968 [3.40]	0.001	.0104326 [2,16]	0.030
N. obs	446		446		446		422	

Notes: t-values in parentheses.

, **, * indicate significance at the 10,5 and 1% significance levels respectively*

(*): The predicted probability obtained from logit regression on a set of regressors:. net foreign asset to gdp, manufactured exports to gdp and the size of population

The diagnostic tests show no evidence of under of overidentification. The Anderson canon. corr. LR (underidentification) statistic = 24.66Chi-sq(1) P-val = 0.0000

The Cragg-Donald F statistic is 25.013well above the range where it would imply any significant bias.

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